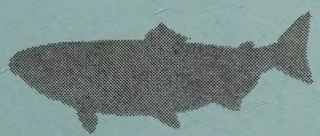
National Marine Fisheries Service
SOUTHWEST REGION
300 S. Ferry Street
Terminal Island, CA 90731

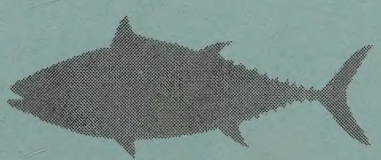


JAN 8 1985
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

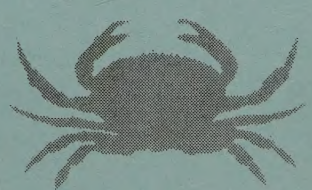
PINNIPED POPULATION STATUS AND RESEARCH IN CHANNEL ISLANDS NATIONAL PARK 1982-1983

by

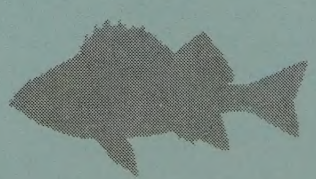
Dana J. Seagars



Library
NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396



OCTOBER 1984



ADMINISTRATIVE REPORT SWR-84-5

"This report is used to ensure prompt dissemination of preliminary results, interim reports, and special studies to the scientific community. The material is not ready for formal publication since the paper may later be published in a modified form to include more recent information or research results. Abstracting, citing, or reproduction of this information is not allowed. Contact author if additional information is required."

PINNIPED POPULATION STATUS AND RESEARCH IN CHANNEL ISLANDS NATIONAL PARK, 1982-1983

A National Marine Fisheries Service Contribution to the National Park Service for the Second Biennial Natural Resources Study Report to Congress as required by P.L. 96-199

Dana J. Seagars
Wildlife Biologist
Southwest Region
National Marine Fisheries Service
Terminal Island, California

ADMINISTRATIVE REPORT SWR-84-5
(Prepared June 1984)
Revised and issued October 1984

TABLE OF CONTENTS

INTRODUCTION.....2

INFORMATION NEEDS.....4

CURRENT TRENDS IN PINNIPED POPULATION DYNAMICS AND DISTRIBUTION.....5

Assessment Techniques.....5

Status of Populations, 1982-1983.....5

UPDATE ON MANAGEMENT ISSUES.....7

INFORMATION GAPS: steps made toward resolution and outstanding data needs.....11

CURRENT (FY 84) PINNIPED RESEARCH WITHIN CHANNEL ISLANDS NATIONAL PARK.....12

PINNIPED RESEARCH PROPOSED FOR FY 85.....13

ACTIONS RECOMMENDED TO BETTER PROTECT THE NATURAL RESOURCES OF THE PARK.....13

TABLES.....15

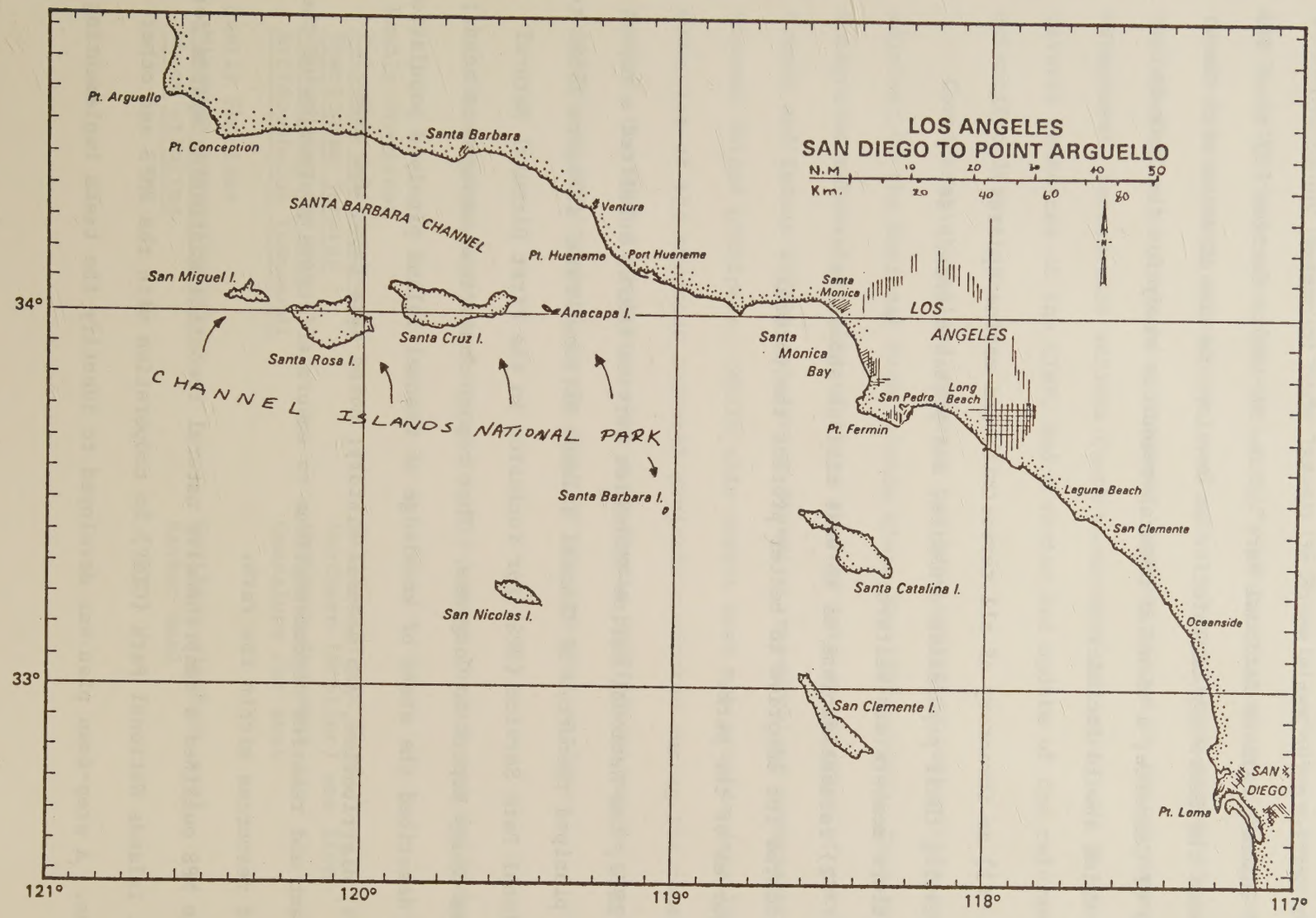
RECOMMENDED ADDITIONS TO CHANNEL ISLANDS NATIONAL PARK MARINE MAMMAL LITERATURE REVIEW.....23

UPDATED REFERENCE LIST.....24

ACKNOWLEDGEMENTS.....30

Digitized by the Internet Archive
in 2025

https://archive.org/details/administrative-report-swr-nmfs-southwest-region_1984-10_5


LOS ANGELES
SAN DIEGO TO POINT ARGUELLO
N.M
Km.
Pt. Arguello
Pt. Conception
Santa Barbara
Ventura
SANTA BARBARA CHANNEL
Pt. Hueneme
Port Hueneme
San Miguel I.
Santa Monica
LOS
ANGELES
Anacapa I.
Santa Cruz I.
Santa Rosa I.
Santa Monica Bay
San Pedro
Long Beach
Pt. Fermin
CHANNEL ISLANDS NATIONAL PARK
Santa Barbara I.
Laguna Beach
San Clemente
Santa Catalina I.
San Nicolas I.
Oceanside
San Clemente I.
SAN DIEGO
Pt. Loma
34°
33°
121°
120°
119°
118°
117°

INTRODUCTION

The 96th Congress called special attention to "the pinnipeds which breed and pup almost exclusively on the Channel Islands, including the only breeding colony for northern fur seals south of Alaska" when it passed "An Act to establish Channel Islands National Park" (P.L. 96-199). Section 203(a) of the Act directed the Secretary of Interior to develop, in consultation with the Secretary of Commerce, a biennial natural resources study for the Park to Congress which should include:

> "(1) an inventory of all terrestrial and marine species, indicating their population dynamics, and probable trends as to future members and welfare;
>
> "(2) recommendations as to what actions should be considered for adoption to better protect the natural resources of the park."

In 1982, the National Marine Fisheries Service (NMFS) submitted a report on "The pinniped resources of Channel Islands National Park" (Seagars 1982) to the National Park Service (NPS) for inclusion in the First Biennial Natural Resources Study Report to Congress. That report summarized management needs; briefly described the state of knowledge of Channel Island pinniped population dynamics, distribution, and natural history; noted data gaps; and made management and research recommendations to ensure effective protection of the pinniped resources within the Park.

The NPS outlined a comprehensive natural resources monitoring system for Channel Islands National Park (CINP) in cooperation with the NMFS and other agencies. A step-down plan was developed to identify the tasks implementing

monitoring programs for resources in the CINP. Natural resources are divided into discrete project areas along taxonomic categories (e.g., pinnipeds). Specific elements are to be addressed for each project. The purpose of this second National Resources Study report (NRS) is to serve as a progress report for each of these elements, including: information needs, development of resource monitoring techniques, evaluation of population trends through implementation of monitoring programs, current issues in marine mammal management, recommended actions (both management and research) to protect natural resources of the CINP, and a review and update of the relevant scientific literature.

Considerable pinniped research has been conducted both within and adjacent to the National Park islands since the 1982 report. This report integrates relevant results of these studies into an overview of current trends and issues in the population dynamics, research and management of Channel Island pinnipeds. While this report does not provide detailed summaries of the numerous research projects conducted during the reporting period, the NMFS anticipates that a synthesis of findings may be prepared in some future NRS; perhaps in the last of the ten year series.

The pinniped species covered in this report include the following:

Family Otariidae	
Zalophus californianus	California sea lion
Eumetopias jubatus	Northern (Steller) sea lion
Callorhinus ursinus	Northern fur seal
Arctocephalus townsendi	Guadalupe fur seal
Family Phocidae	
Mirounga angustirostris	Northern elephant seal
Phoca vitulina	Harbor seal

INFORMATION NEEDS

The first NRS report noted that certain basic data needed to be collected in order to monitor effectively the pinniped populations of CINP. This information, prioritized from highest to lowest importance, includes: assessment of annual reproductive effort (pup production, age-specific rates); site-specific, long-term census data to measure trends in abundance and distribution; age and sex composition of populations (age-specific survivorship); movement patterns (seasonal, daily); food habits (species taken, season-specific variation); behavioral factors (i.e., reproductive, hauling cycles); and other factors of life history which may influence estimates of population size and dynamics, or sampling design.

The basic information needed to monitor pinniped populations has not changed since the previous NPS report. Considerable data have been collected over the past two years. However, as the documentation of population fluctuations is a dynamic process rather than a discrete project, it is anticipated that monitoring type research will continue to collect basic life history and population data throughout the ten year NRS period.

Several information needs have been moved up in priority or have been identified as requiring new or additional emphasis. These include: the assessment of marine mammal-fishery interactions and levels of associated marine mammal mortality, assessment of the potential for impact on marine mammals in the Channel Islands due to entanglement in net debris, and a description of feeding areas utilized by marine mammals.

CURRENT TRENDS IN PINNIPED POPULATION DYNAMICS AND DISTRIBUTION

Assessment Techniques. Trends in pinniped population dynamics currently are evaluated by a comparison of annual indices of abundance; this method is referred to as the Dynamic Response Method (DRM). Pup counts are used to index changes in population size for California sea lions, northern fur seals, and elephant seals. These counts also are used to assess population status relative to optimum levels. For the remaining species, the indices are based on maximum counts of total numbers taken at standardized times.

In cooperation with the NOAA Marine Sanctuaries Program, the NMFS and other pinniped population experts are in the process of finalizing "A Guide to Censusing Pinnipeds in Channel Islands National Park" (DeMaster et al. in press). This report describes the techniques and procedures necessary to collect data appropriate for use in the DRM method of population assessment. The report also outlines a standardized report format so that data may be easily presented and compared throughout the monitoring program.

Status of populations, 1982-1983. During 1982-1983, the NMFS refined ongoing studies to incorporate the above censusing techniques while continuing to collect pinniped population data. Studies to provide these data were conducted by numerous investigators and agencies, including the NMFS (Southwest Fisheries Center and National Marine Mammal Laboratory), the California Department of Fish and Game, Hubbs/Sea World Research Institute, University of California at Santa Cruz, and San Diego State University.

Tables 1 and 2 summarize the status of 1983 pinniped populations within Channel Islands National Park and provide an analysis of population trends based upon the best information available. For comparison, tables 3 and 4 show pinniped population status and trends based on information from the 1981 season.

The 1983 pup production for California sea lions and northern fur seals declined significantly from the level reported for 1981. Total numbers of harbor seals and northern sea lions declined slightly. The numbers of northern elephant seals continued to increase at a rapid rate. Research conducted at other rookery islands outside of the Park indicated similar population trends for these species. The declines in pupping may be related to effects of the El Nino condition (unusually warm water) which occurred throughout the Pacific and persisted through the 1982-1983 breeding seasons. As a result of this condition, preferred prey items may not have been as readily available to sea lions and fur seals foraging during the breeding season in waters adjacent to the rookeries of the Southern California Bight. Continued analysis of food habit samples and feeding and nursing behavior may provide a better understanding of the 1982-83 fluctuations.

An analysis of the literature from 1850 to the present was prepared to describe long-term trends in the use and location of California and northern sea lion rookeries (Seagars et al. 1984). This analysis will provide a basis for assessing trends in distribution over time.

The recent protocol of describing pinniped distribution through standardized numbered sections of coastline has been continued. No major changes in pinniped use were noted during the 1982-1983 seasons. Previously used areas continued to be used, although in somewhat varying densities depending on the reproductive trends noted above.

UPDATE ON MANAGEMENT ISSUES

Marine mammal-fisheries interactions. The NMFS and the California Department of Fish and Game (CDFG) are in the fifth year of a project to determine numbers and methods of the take of marine mammals incidental to commercial fishing. Investigations (Herder 1983; Miller 1981, 1983; Miller et al. 1983) to date have examined all California commercial and recreational fisheries to describe marine mammal mortality and economic impacts on fisheries from gear and fish loss. The fisheries most adversely impacted by interactions were the commercial salmon troll fishery, the California halibut gillnet fishery, the Klamath River gillnet salmon fishery, and the partyboat fishery near San Diego. Possible marine mammal mortality caused by fishing activities annually for all fisheries throughout California was estimated to include about 1,500 sea lions, 117 harbor seals, 25 elephant seals, and 80 cetaceans (Miller et al. 1983).

Marine mammal-fisheries interactions in or adjacent to CINP and National Marine Sanctary were reported to occur predominately in two commercial fisheries: the shark drift gillnet fishery and the California halibut fishery. In 1980, the relatively new shark drift gillnet fishery accounted for the mortality of approximately 1,160 California sea lions (Miller et al. 1983). This mortality was predominately associated with fishing effort concentrated around San Miguel, Santa Rosa, and Santa Cruz Islands and along the Santa Rosa-Cortes Ridge. Throughout 1981 and 1982, the NMFS worked with the CDFG to assess the impacts of this mortality on the sea lion population and to provide recommendations to the State legislature for pending legislation. An assessment of California sea lion population trends made in 1982 concluded that the population was continuing to increase in spite of the level of mortality. In 1982, the State limited entry to the drift gillnet

fishery and implemented gear restrictions and season and area closures to reduce the rate of interaction. It has not been possible to document the effectiveness of the seasonal and area closures due to a shift in fishing effort. However, the CDFG monitoring program indicates that mortality due to this fishery has declined.

Marine mammal mortality in the southern California halibut fishery primarily involves harbor seals. The mortality of harbor seals in 1980 was estimated to be about 75 individuals. Fishermen were estimated to sustain about a 10 percent depredation rate or a $46,640 total annual loss (Miller et al. 1983). The current rate of mortality probably is not affecting the harbor seal population adversely.

In 1984, the NMFS accepted a petition from the Sportfishing Association of California to consider changing federal regulations to provide for the non-lethal harassment of marine mammals by commercial passenger sportfishing vessel operators. The NMFS anticipates making a determination on this issue in 1984. Should the requested action be implemented, the non-lethal harassment of marine mammals near commercial sport fishing vessels could be expected to increase within and adjacent to CINP.

The NMFS and the CDFG are studying ways to refine fishing techniques and gear to reduce levels of interaction and mortality. The CDFG will continue assessing levels of marine mammal-fisheries interactions in fiscal years 1984 and 1985.

Net debris. The possibility that discarded or lost net material could adversely affect marine mammal populations is being studied in areas other than the Channel Islands. There is no indication that this is a problem for pinnipeds in the Channel Islands; however, no information is available describing the frequency of entanglement or occurrence of net material in

waters or rookeries of the Channel Islands. The NMFS has begun to work with the NPS and the NOAA Marine Sanctuaries Program to collect such information.

Fisheries Management. Intensive commercial and sport fishing activity around the Channel Islands has raised concern for the conservation of an adequate food base necessary to support marine mammal populations. The Magnuson Fishery Conservation and Management Act requires fishery management councils to consider the requirements of predator species when developing fishery management plans (FMPs). Through coordination with the Councils and the CDFG, the NMFS will continue to encourage the application of a forage reserve concept within FMPs. Results from NMFS pinniped food habit studies conducted in recent years are being analyzed. Continued work will eventually identify the important prey species for each marine mammal population. In addition, research has been proposed to conduct sonic tracking of pinnipeds and to expand depth of dive studies to define foraging habitat. As information from fisheries studies estimating the seasonal biomass of species utilized as prey by pinnipeds (e.g., squid, juvenile rockfish, whiting) becomes available, the diversity and dimension of the forage reserves necessary to maintain healthy pinniped populations will be estimated or refined and integrated into FMPs.

Human disturbance. Visitation, fishing, military operations, research, and park operations are all activities which contribute to the potential for human disturbance to pinnipeds; all are expected to increase with operation of CINP. Pinnipeds may react to human disturbance by altering normal behavior patterns and ultimately by abandoning or avoiding chronically disturbed areas. The NPS and NMFS are continuing to work closely to ensure that disturbance to pinnipeds is minimized through actions detailed by the CINP General Management Plan, including the coordination of research and

cooperative law enforcement activities. Levels and locales of visitor use are being assessed by an aerial survey cooperatively conducted by the NOAA Marine Sanctuaries Program and the NPS. The NMFS has identified sensitive areas to the NPS and has proposed to conduct cooperative studies to assess visitor impact on pinnipeds in areas of potential "high risk."

Petitions to list two species pursuant to the Endangered Species Act. The NMFS has received a petition to list the Guadalupe fur seal (Arctocephalus townsendi) as an endangered species and a petition to list the northern fur seal (Callorhinus ursinus) as a threatened species under the Endangered Species Act (ESA). The NMFS has determined that these petitions present substantial information indicating that the petitioned listings may be warranted and has initiated a review of these species' status. The NMFS will use these status reviews to make a decision concerning the appropriateness of proposing to list either of these species. The NMFS anticipates making a decision in late 1984 for the Guadalupe fur seal and in mid-1985 for the northern fur seal. Section 7(a)(4) of the ESA requires Federal agencies to confer with the Secretary of Commerce on any agency action which is likely to jeopardize the continued existence of any species proposed for listing. Because the NMFS is considering petitions to list the Guadalupe fur seal and the northern fur seal, the NMFS and NPS have discussed the potential management implications of listing these species and will coordinate closely in the event of any proposed federal actions which could result in adverse impacts to either species.

INFORMATION GAPS

Population trends. The data base necessary to determine and monitor trends in current population status relative to optimum sustainable population (per MMPA), or to predict "probable trends as to future numbers and welfare" (per P.L. 96-199) for most species of pinnipeds in CINP should be adequate, provided monitoring studies are continued at the current level throughout the ten year period established by Congress.

Distribution. Recent studies have identified the current hauling and breeding regions for most of the Channel Islands in sufficient detail to document long term fluctuations in rookery use. However, long term site-specific studies are required to describe seasonal and annual fluctuations in more detail, to document expansion and/or contraction of use relative to environmental and anthropogenic parameters such as visitor use.

Food habits. Current knowledge of the species of pinniped prey taken; relative dietary composition; seasonal, age, sex, and species-specific variation; and the contribution of in-Park versus outside the Park boundary resources remains inadequate. While some data have been collected, most remains to be analyzed and presented in a format useful for making management recommendations. Considerable research remains to be done in this subject area.

Natural history. Some advances have been made in our understanding of what constitutes normal marine mammal behavior (e.g., seasonal and daily haulout patterns) and life history parameters (e.g., age at first reproduction, life expectancy) for some species. This information contributes to refinements in population models, improved sampling technique and design in population dynamics studies, and recommendations for minimizing anthropogenic disturbance. Continued work needs to be accomplished in this area for all

pinniped species, unfortunately it is of a lower priority and may not be forthcoming in the near future. The two species for which we know the least are the Guadalupe fur seal and the harbor seal.

Disturbance. Numerous activities have the potential to disturb pinnipeds (see page 9). A baseline understanding for the frequency of occurrence of these events is not available. Therefore, we are only able to speculate on the impact of these events and cannot identify problem areas with certainty. Some areas are likely to be disturbed more often than others; this level of disturbance may influence pinniped distribution and reproductive success. Information remains to be collected for "high risk" areas to quantify the frequency and intensity of disturbance. This study should provide an analysis of how disturbance influences pinniped behavior and reproductive effort.

CURRENT (FY 84) PINNIPED RESEARCH WITHIN CHANNEL ISLANDS NATIONAL PARK

Ongoing pinniped research conducted on the Channel Islands has been designed to provide data to satisfy the legislative mandates of the MMPA and P.L. 96-199 as well as resolve the deficiencies noted in the previous section. NMFS funded research within CINP is conducted by the Southwest Fisheries Center (SWFC), National Marine Mammal Laboratory (NMML), and numerous contractors including: California Department of Fish and Game (CDFG), Hubbs/Sea World Research Institute (H/SWRI), University of California at Santa Cruz (UCSC), and San Diego State University (SDSU). Additional research is funded by the NOAA Marine Sanctuaries Program (MSP) and the U.S. Air Force (USAF). Projects currently in progress or scheduled to begin in 1984 (FY 84 funding) are listed in Table 5.

PINNIPED RESEARCH PROPOSED FOR FY 85

Included in Table 6 is a list of pinniped research activities proposed for CINP, for nearby islands in which study animals may move into the Park, or for other areas where the study results are likely to have direct implications to pinnipeds within the Park. Initiation of these projects is subject to the availability of funding.

ACTIONS RECOMMENDED "TO BETTER PROTECT THE NATURAL RESOURCES OF THE PARK"

A. Continue to manage pinniped populations consistent with the mutual objectives of the NPS and NMFS as outlined in the Channel Islands National Park Natural Resources Management Plan, the current Memorandum of Agreement between NMFS and NPS, and the intent of the Marine Mammal Protection Act of 1972, as amended.

B. Continue to monitor trends in distribution and abundance for all pinniped species within the CINP, collect life history data, and synthesize this information into an assessment of population status relative to optimum sustainable population for California sea lions in 1985, and for elephant seals and harbor seals in 1988. To meet this goal, the current and proposed levels of data collection through the NMFS Coastal Marine Mammal Research and Management Program are essential.

C. Expand ongoing projects and initiate the following new projects (in order of priority):

(1) Initiate sonic tracking studies of the pelagic distribution and abundance of pinnipeds within Channel Islands National Park and Marine Sanctuary. This information will provide correction factors for population estimates made from counts on the hauling/breeding grounds, an estimate of the

numbers of pinnipeds potentially impacted by oil spills, and an evaluation of the contribution of these waters to pinniped foraging activities;

(2) Expand assessment of human disturbance and haulout and movement patterns of harbor seals at Santa Rosa, Santa Cruz, Santa Barbara, and Anacapa Islands;

(3) Assess reproductive status, seasonal use, and human disturbance of California sea lions at Santa Rosa, Santa Cruz, and Anacapa Islands; and

(4) Initiate a systematic survey of selected island beaches to document the frequency of occurrence and type of net debris.

Current NMFS research and management priorities preclude expedient collection of items (2) and (3). This information will assist the NMFS when making management recommendations to NPS pertinent to planning for visitor use at these islands. Information collected to date has been considered by NMFS and NPS in the revision of the CINP General Management Plan (summer 1984); additional work should be conducted and considered prior to initiating public visitation to Santa Rosa and Santa Cruz Islands.

Table 1. Pinniped pup production and total counts of harbor seals for 1983 (estimated from maximum aerial or ground censuses) by island for Channel Islands National Park.[1]

Species	Island				
	San Miguel	Santa Rosa	Santa Cruz	Anacapa	Santa Barbara
California sea lion	7330(a,b)	0(b,c,d)	0(b,d)	1(d)	425(b,c,e)
Northern sea lion	0(a)	0(b,c,d)	NHP	NHP	NHP
Northern fur seal	546(f)	NHP	NHP	NHP	NHP
Guadalupe fur seal	0(a)	NHP	NHP	NHP	NHP
Northern elephant seal	8500(g)	0(f)	NHP	NHP	68(e)
Pacific harbor seal[2]	1004(b)	910(b)	588(b)	315(b)	0(b)

NHP means island not believed to have been used historically as a pupping site.

[1] Sources denoted by abbreviations in parentheses as follows:

(a) DeLong, R.L., G.A. Antonelis, and E. Jameyson. In prep. California sea lion pup production, premature births, and neonatal mortality estimates at San Miguel Island, 1979-1983. NWAFC, NMML.
(b) Stewart, B.S. and P.K. Yochem. 1983. Aerial surveys of pinniped populations in the Channel Islands National Park, 1983. H/SWRI Technical Rept. 82-165. Final Rept to NMFS, SWFC, La Jolla, CA; contract 83-ABC-00136. 25 p.
(c) DeMaster, D.P., R.L. Delong, and D. Hanan. In prep. Dynamic response analysis of sea lion pup counts in the southern California Bight. NMFS, SWFC, Admin. Rept.
(d) Seagars, D.J., D.P. DeMaster, and R.L. DeLong. In prep. A survey of historic rookery sites for California and northern sea lions in the southern California Bight. NMFS, SWFC, Admin. Rept.
(e) Hansen, L. 1984. Status report on pinniped research at Santa Barbara Island, California; June 1983-February 1984. NMFS, SWFC. Internal memo on file, Southwest Region, Terminal Island, CA 27p.
(f) Kozloff, P. (ed.) In prep. Fur seal investigations, 1983 NWAFC. Processed report.
(g) Stewart, B.S. H/SWRI. pers. comm.

[2] Total counts, not pup counts, see text.

Table 2. Estimated trends in pinniped numbers[1] within Channel Islands National Park[2], 1983.

Species	Island				
	San Miguel	Santa Rosa	Santa Cruz	Anacapa	Santa Barbara
California sea lion	Inc(+)[3]	NHP	Np(-)	Np(-)[4]	Flct(-)
Northern sea lion	Dcl(+)	Np(+)	Np(+)	NHP	NHP
Northern fur seal	Inc(+)[3]	NHP	NHP	NHP	NHP
Guadalupe fur seal	Np(+)	NHP	NHP	NHP	NHP
Northern elephant seal	Inc(+)	Np(+)	Np(+)	NHP	Stb(+)
Pacific harbor seal	Inc(-)[3]	Inc(0)[3]	Flct(0)	Flct(0)	Flct(0)

[1] Trends of "numbers" based on pup counts for sea lions, fur seals and elephant seals; total counts of harbor seals.

[2] Abbreviations as follows: Inc, increasing; Dcl, declining; Stb, stable; Unk, unknown; Np, no pupping in 1983; Flct, fluctuating; NHP, island not believed to have been used historically as a pupping site. Reliability of data prior to 1981 indicated as follows: (+) reliable, based on at least 5 years of data; (-) marginal, limited to recent data only; (0) no good time series, or no data. Sources as presented in Table 1.

[3] While numbers declined from those reported for 1981, the long term trends are believed to be continuing to increase.

[4] One pup was observed here in 1983, however, it is unknown if this was the birth site of this individual.

Table 3. Pinniped pup production for 1981 (estimated from maximum aerial or ground censuses) by island for Channel Islands National Park.[1]

Species	Island				
	San Miguel	Santa Rosa	Santa Cruz	Anacapa	Santa Barbara
California sea lion	8,255(a)	0(b)	0(b)	0(b)	730(d)
Northern sea lion	<5(b)	0(b)	0(b)	NHP	NHP
Northern fur seal	1,220(c)	NHP	NHP	NHP	NHP
Guadalupe fur seal	0(c)	NHP	NHP	NHP	NHP
Northern elephant seal	7,062(b)	0(b)	0(b)	NHP	-(e)
Pacific harbor seal	186(b)	226(b)	86(b)	25(b)	3(b)

NHP means island not believed to have been used historically as a pupping site.

[1] Sources denoted by abbreviations in parentheses as follows:

(a) DeLong, R.L., G.A. Antonelis, and E. Jameyson. 1982. California sea lion pup production, premature births, and neonatal mortality estimates at San Miguel Island, 1969-1981. NWAFC, NMML. In prep.

(b) Stewart, B.S. 1982. Studies on the pinnipeds of the California Channel Islands, 1980-81. H/SWRI Tech. Rept. 82-136, 117 pgs.

(c) Kozloff, P. (ed) In prep. Fur seal investigations, 1981. NWAFC. Processed report.

(d) Heath, C.B. and J.M. Francis, 1982. Population dynamics and ecology of California sea lions (Zalophus californianus) on San Nicolas and Santa Barbara Islands, California during the 1981 breeding season. NMFS, SWC Tech. Rept. (in prep).

(e) No total pup count available, 1980 production was 63; Seagars, unpubl. data.

Table 4. Estimated recent trends[1] in pup production for pinniped species in Channel Islands National Park[2], 1981.

Species	Island				
	San Miguel	Santa Rosa	Santa Cruz	Anacapa	Santa Barbara
California sea lion	Inc(+)	Np(-)	Flct(-)	Np(-)	Flct(-)
Northern sea lion	Dcl(+)	Np(+)	Np(+)	NHP(+)	NHP(+)
Northern fur seal	Inc(+)	NHP(0)	NHP(0)	NHP(0)	NHP(0)
Guadalupe fur seal	Np(+)	NHP(0)	NHP(0)	NHP(0)	NHP(0)
Northern elephant seal	Inc(+)	Np(-)	Np(-)	NHP(-)	Stb(+)
Pacific harbor seal	Inc(-)	Unk(0)	Unk(0)	Unk(0)	Unk(0)

[1] Trends of "numbers" based on pup counts for sea lions, fur seals, and elephant seals; total counts of harbor seals.

[2] Sources are the same as listed by island in Table 3 with addition of: Bonnell et al. 1981. Pinnipeds of the southern California Bight. BLM. Abbreviations as follows: Inc, increasing; Dcl, declining; Stb, stable; Unk, unknown; Np, no pupping in 1981; Flct, fluctuating; NHP, island not believed to have been used historically as pupping site. Reliability of estimates indicated as follows: (+) reliable, based on at least 5 years of data; (-) marginal, limited to recent data only; (0) no good time series, or no data.

Table 5. Pinniped research programmed for FY84 pertinent to management of Channel Islands National Park. Acronyms are defined in text.

Investigator & Institution		Title or Description	Sponsor/ Funding ($)	Region/ Island(s)
DeMaster	SWFC	Continued refinement of monitoring system for pinniped population dynamics assessment within CINP.	MSP 20K	All park islands
Perryman DeMaster	SWFC	Development of photogrametric survey techniques (includes Wilson & Richardson Rocks)	MSP continuing	SMI,SBI
Hansen DeMaster	SWFC	Movement patterns and response to disturbance of harbor seals	MSP 3K	SRI
Hansen Hawes	SWFC	Population dynamics and behavior of Calif. sea lions	SWFC 15K	SBI
Hawes	SWFC	Food habit analysis from Calif. sea lion scats	SWFC 10K	SBI
Antonelis DeMaster	NMML SWFC	Food habits of northern elephant seals	NMFS 4K	SMI
Stewart Yochem	H/SWRI	Population monitoring of pinnipeds within So. Calif. Bight	USAF ?	SMI SNI
Stewart	H/SWRI UCLA	Breeding behavior and pup production of northern elephant seal	?	SNI SMI
Hanan	CDFG	Marine mammal fisheries interation studies	SWFC SWR 45K	Offshore Calif. waters
Hanan	CDFG	Population assessment of harbor seals in Calif. (aerial surveys)	CDFG 3K NMFS 20K	CA Channel Is. CA coast
DeLong/ Antonelis DeMaster	NMML SWFC	Pup production of Calif. sea lions	NMML 5K	SMI
DeLong Antonelis	NMML	Population dynamics and behavior of northern fur seals	NMML 70K	SMI

Table 5 (Continued).

Investigator & Institution		Title or Description	Sponsor/ Funding ($)	Region/ Island(s)
DeLong Antonelis	NMML	Allocation of food resources among the four abundant pinniped species at San Miguel Is. (seasonal collection and analysis of scat from fur seals, elephant seals, harbor seals and Calif. sea lions).	NMML 10K	SMI
DeLong Antonelis Costa	NMML UC, Santa Cruz	Female Calif. sea lion energetics & feeding studies	NMML 10K Sea Grant ? K	SMI
Seagars DeMaster	SWR SWFC	Historical rookery review and annual assessment	NPS, NMFS, MSP, 2K	Northern Channel Islands

Table 6. Pinniped research proposed for FY85 pertinent to arrangement of Channel Islands National Park. Acronyms are defined in text.

Investigator & Institution		Title or Description	Sponsor/ Funding[1]	Region/ Island(s)
DeMaster	SWFC	Continued refinement of monitoring system for assessing pinniped population dynamics	MSP 20K	All Park Is.
Perryman DeMaster	SWFC	Continued refinement of photogrametric survey techniques for Mirounga and Zalophus	MSP continuing	SMI, SBI
DeMaster	SWFC	Identification of Calif. sea lion foraging regions (sonic tracking)	MSP? ?K	SMI, Santa Cruz Is., SBI
DeMaster	SWFC	Continued assessment of movement and site fidelity of harbor seals	MSP, NPS, NMFS 3K?	SRI
DeMaster	SWFC	Assessment of disturbance to Calif. sea lions	NMFS ?K NPS	Anacapa Is. Santa Cruz Is.
DeMaster Hawes	SWFC	Population dynamics and behavior of Calif. sea lion	SWFC 15K	SBI
Hawes	SWFC	Food habit analysis from Calif. sea lion scats	SWFC 10K	SBI
Stewart Yochem	H/SWRI	Population monitoring of pinnipeds within So. Calif. Bight	USAF ?K	SMI SNI
Stewart	H/SWRI UCLA	Breeding behavior and pup production of northern elephant seal	?	SNI SMI
Hanan	CDFG	Marine mammal-fisheries interactions	SWR 45K SWFC	CA costal waters
Hanan	CDFG	Population assessment of harbor seals	NMFS 20K CDFG 3K	CA coast + CA Channel Is
DeLong DeMaster	NMML CDFG	California sea lion pup production	NMML 5K	SMI

Table 6 (Continued).

Investigator & Institution		Title or Description	Sponsor/ Funding[1]	Region/ Island(s)
DeLong Antonelis	NMML	Population dynamics, energetics and feeding behavior of northern fur seal	NMML 70K	SMI
DeLong/ Antonelis Davis	NMML Scripps	Energetics and feeding behavior of harbor seals	NMML 10K	SMI
Delong Antonelis	NMML	Analysis and sythesis of the food resources allocation studies	NMML ?K	SMI
Antonelis DeMaster	NMML SWFC	Stomach contents of northern elephant seals	NMFS 5K	SMI
Antonelis Costa	NMML UCSC	Energetics of female Calif. sea lions	NMFS 10K Sea Grant ?K	SMI

RECOMMENDED ADDITIONS TO CHANNEL ISLANDS NATIONAL PARK MARINE MAMMAL LITERATURE REVIEW

The following list of references is intended to update the literature review conducted by the Santa Barbara Museum of Natural History in 1980 and supplemented by our first NRS submission. The list is complete through March, 1984. The findings discussed in the preceding report are based on reports and papers contained in this list. All materials are on file at the Southwest Region, NMFS, Terminal Island, CA.

UPDATED REFERENCE LIST

Abbott, C.G. 1939. Sea lion slaughter. Bird Lore 41(4):265-270.

Ainley, D.G., H. Huber, and K.M. Bailey. 1982. Population fluctuations of California sea lions and the Pacific whiting fishery off central California. Fish. Bull. (US) 80(2):253-258.

Atwood, D.K. and R.L. Ferguson. 1982. An example study of the weathering of spilled petroleum in a tropical marine environment: IXTOC - 1. Bull. Mar. Sci. 32(1):1-13.

Aurioles, D., F. Sinsel, C. Fox, E. Alvarado, and O. Maravilla. 1983. Winter migration of subadult male California sea lions (Zalophus californianus) in the southern part of Baja California. J. Mammal. 64(3):513-518.

Barber, R.T. and F.P. Chavez. 1983. Biological consequences of El Nino. Science 222:1203-1210.

Bigg, M.A. 1984. Stimuli for parturition in northern fur seals (Callorhinus ursinus). J. Mammal. 65(2):333-336.

Brown, R.F. and B.R. Mate. 1983. Abundance, movements, and feeding habits of harbor seals, Phoca vitulina, at Netarts and Tillamook Bays, Oregon. Fish. Bull. (US) 81(2):291-301.

Collie, J.S. and M.P. Sissenwine. 1983. Estimating population size from relative abundance data measured with error. Can. J. Fish. Aquat. Sci. 40:1871-1879.

Condit, R. and B.J. LeBoeuf. 1984. Feeding habits and feeding grounds of the northern elephant seal. J. Mammal. 65(2):281-290.

Cooper, C.F. and B.S. Stewart. 1983. Demography of northern elephant seals, 1911-1982. Science 219:969-971.

Costa, D.P. and L. Higgins. 1983. Progress report on assessment of the impact of the California sea lion and elephant seal on commercial fisheries. Unpubl. manuscript on file NMFS/SWR, Terminal Island, CA. 9 pages.

DeLong, R.L. 1982. Population biology of northern fur seals at San Miguel Island, California. Berkeley, CA: UC Berkeley. 185 p. Dissertation.

DeMaster, D.P. 1981. Incorporation of density dependence and harvest into a general population model for seals. In: C.W. Fowler (Ed.) Dynamics of large mammal populations. New York: John Wiley and Sons. pp. 389-401.

DeMaster, D.P. 1984. A review of density dependence in marine mammals. Proc. Workshop Biol. Interact. Mar. Mamm. Comm. Fisheries S.E. Bering Sea. Alaska Sea Grant Rept 84-1. Univ. Alaska: Fairbanks, AK. pp 139-148.

DeMaster, D.P., R.L. DeLong, B.S. Stewart, P.K. Yochem, and G.A. Antonelis. In press. A guide to censusing pinnipeds in Channel Islands National Park, NMFS, SWFC Admin. Rept. LJ-84-?, 58 p.

DeMaster, D.P., D.J. Miller, D. Goodman, R.L. DeLong, and B.S. Stewart. 1982. Assessment of California sea lion fishery interactions. Trans. 47th N. American Wildl. Nat. Res. Conf. Washington, D.C. pp. 253-264.

Dorrance, M.J. 1983. A philosophy of problem wildlife management. Wildl. Soc. Bull. 11(4):319-324.

Englehardt, F.R. 1983. Petroleum effects on marine mammals. Aquat. Tox. 4:199-217.

Englehardt, F.R. 1982. Hydrocarbon metabolism and cortisol balance in oil-exposed ringed seals, Phoca hispida. Comp. Biochem. Physiol. (C) Comp. Pharmacol. 72(1):133-136.

Engelhardt, F.R. 1979. Functional Roles of cortisol in phocid seals. Abstracts 3rd Biennial Conf. Biol. Marine Mammals. Seattle, WA: Oct. 7-11, 1979; p. 17.

Engelhardt, F.R. 1977. Changes in physical and chemical characteristics of blood in phocid seals as related to molt. Abstracts 2nd Conf. Biol. Marine Mammals. San Diego, CA: Dec 11-15, 1977; p. 42.

Engelhardt, F.R., J.R. Geraci, and T.G. Smith. 1977. Uptake and clearance of petroleum hydrocarbons in the ringed seal, Phoca hispida. J. Fish Res. Board Can. 34:1143-1147.

Fedak, M.A., S.S. Anderson, and M.G. Curry. 1983. Attachment of a radio tag to the fur of seals. J. Zool. 46:298-300.

Felton, R. 1981. Effect of tag loss on estimation of animal abundance. N.Z.J. Ecol. 4:128-129.

Feltz, E.T. and F.H. Fay. 1966. Thermal requirements in vitro of epidermal cells from seals. Cryobiology 3(3):261-264.

Fisus, C.H. 1982. Predation by marine mammals on the squids of the eastern north Pacific Ocean and the Bering Sea. Mar. Fish. Rev. 44(2):1-10.

Ford, R.G. 1983. Home range in a patchy environment: optional foraging predictions. Amer. Zool. 23(2):315-326.

Fowler, C.W. 1982. Interactions of northern fur seals and commercial fisheries. Trans. 47th N. Amer. Wildl. Nat. Res. Conf. Portland, OR. pp. 278-292.

Francis, R.C. 1983. Population and tropic dynamics of Pacific hake (Merluccius productus). Can. J. Fish. Aquat. Sci. 40:1925-1943.

Furness, R.W. 1981. Estimating the food requirements of sea bird and seal populations and their interactions with commercial fisheries and fish stocks. In: J. Cooper (Ed.) Proc. Symp. Birds of the Sea and Shore. Afr. Seabird Grp., Capetown. pp. 1-13.

Gentry, R.L. and J.R. Holt. 1982. Equipment and techniques for handling northern fur seals. NOAA Technical Rept. NMFS SSRF-758. 15 pgs.

Gentry, R.L. and J.H. Johnson. 1981. Predation by sea lions on northern fur seal neonates. Mammalia 45(4):423-430.

Gilpin, M.A. and J.A. Diamond. 1980. Subdivision of nature reserves and the maintenance of species diversity. Nature 285:567-568.

Goldbatt, C.J. and R.G. Anthony. 1983. Heavy metals in northern fur seals (Callorhinus ursinus) from the Pribiloff Islands, Alaska. J. Environ. Qual. 12(4):478-482.

Graybill, M.R. 1981. Haulout patterns and diet of harbor seals, Phoca vitulina, in Coos County, Oregon. Corvaillis, OR: Univ. Oregon. 55 p. Thesis.

Gundlach, E.R., P.D. Boehm, M. Marchand, R.M. Atlas, D.M. Ward, and D.A. Wolfe. 1983. The fate of Amoco Cadiz Oil. Science 221:122-129.

Hall, K.J. and A.J. Williams. 1981. Animals as agents of erosion at sub-Antarctic Marion Island. S. Afr. J. Antarct. Res. 10/11:18-24.

Hansen. L. 1984. Status report on pinniped research at Santa Barbara Island, California, June 1983 - February 1984. NMFS, SWFC Internal memo on file Southwest Region, Terminal Island, CA, 27 p.

Heath, C.B. and J.M. Francis. 1983. Population dynamics and feeding ecology of the California sea lion with applications for management. Results of 1981-1982 research on Santa Barbara and San Nicolas Islands. NMFS, SWFC Admin. Rept. LJ-83-04C; 48 p.

Herder, M.J. 1983. Pinniped-fishery interactions in the Klamath River system, July 1979 to October 1980. NMFS, SWFC Admin. Rept. LJ. 83-12c. 71p.

Higgs, A.J. and M.B. Usher. 1980. Should nature reserves be large or small? Nature 285:568-569.

Holden, A.V. 1978. Pollutants and seals. Mammal Rev. 8:53-66.

Jackson, T.D. 1983. Cost-effectiveness of management activities related to the interaction between the California sea lion and the southern California shark gill-net fishery. Monterey, CA: Naval Post Graduate School Monterey. 87 p. Thesis.

Kajimura, H. 1984. Opportunistic feeding of the northern fur seal, Callorhinus ursinus, in the eastern north Pacific Ocean and eastern Bering Sea. NOAA Tech. Rept. NMFS SSRF-779, 49 p.

Kelly, B.P. 1981. Pelage polymorphism in Pacific harbor seals. Can. J. Zool. 59(7):1212-1219.

Kolb, P.M. 1982. A harbor seal, Phoca vitulina richardi, taken from a sablefish trap. Calif. Fish and Game 68(2):123-124.

Kozloff, P. In prep. Fur seal investigations, 1983. NMFS, NWAFC, NMML Draft Processed report.

Kozlowski, J. 1980. Density dependance, the logistic equation, and r- and k-selection: a critique and an alternative approach. Evol. Theory 5:89-101.

Lavigne, D.C. 1982. Marine mammal-fishery interactions: a report from an IUCN workshop. Trans. 47th N. Amer. Wildl. Nat. Res. Conf. Portland, OR. pp. 312-321.

LeBoeuf, B.J., M. Riedman, and R.S. Keyes. 1982. White shark predation of pinnipeds in California coastal waters. Fish. Bull. (US) 80(4):891-895.

LeBoeuf, B.J., D. Aurioles, R. Condit, C. Fox, R. Gisiner, R. Romero, and F. Sinsel. 1983. Size and distribution of the California sea lion population in Mexico. Proc. Calif. Acad. Sciences 43(7):77-85.

Loughlin, T.R., L. Consiglieri, R.L. DeLong, and A.T. Actor. 1983. Incidental catch of marine mammals by foreign fishing vessels, 1978-81. Mar. Fish. Rev. 45(7-9):44-49.

McKenna, M.G. and B. Lyott. 1984. Taking the offense in wildlife management. Wild. Soc. Bull. 12:79-81.

Miller, D.J. 1983. Coastal marine mammal study, annual report for the period of July 1, 1981-June 30, 1982. NMFS, SWFC, Admin. Rept. LJ-83-21C. 130p.

Miller, D.J. 1981. Marine mammal-fisheries interaction study, annual report for the period of July 1, 1979 to June 30, 1980. NMFS, SWFC Admin. Rept. No. LJ-81-01C. 42 p.

Miller, D.J., M.J. Herder, and J.P. Scholl. 1983. California marine mammal-fishery interactions study, 1979-1981. NMFS, SWFC Administrative Rept. LJ-83-13C. 233 p.

Nicholson, K. 1983. A report on the 1983 tagging study of California sea lions (Zalophus californianus californianus) unpublished manuscript on file NMFS, SWFC, La Jolla, CA. 12 pgs.

Odell, D.K. 1981. California sea lion - Zalophus californianus. In: Ridgway, S.H. and R.J. Harrison (eds.) Handbook of marine mammals. London: Academic Press. pp. 67-98.

Pitcher, K.W. and F.H. Fay. 1982. Feeding by Stellar sea lions on harbor seals. Murrelet 63(2):70-71.

Reijnders, P.J.H. 1983. The effect of seal hunting in Germany on the further existence of a harbour seal population in the Dutch Wadden Sea. Z. Saugetierk. 48(1):50-54.

Renouf, D., L. Gaborko, G. Galway, and R. Finlayson. 1981. The effect of disturbance on the daily movements of harbor seals and grey seals between the sea and their hauling grounds at Miquelon. Appl. Anim. Ethol. 7(4):373-379.

Schneidner, D.C. and P.M. Payne. 1983. Factors affecting haul-out of harbor seals at a site in southeastern Massachusetts. J. Mamm. 64(3):518-520.

Scholl, J.P. 1983. Skull fragments of the California sea lion (Zalophus californianus) in stomach of a white shark (Caraharodon carcharias). J. Mammal. 64(2):332.

Seagars, D.J. 1982. The pinniped resources of Channel Islands National Park. NMFS contribution to the NPS for the 1st Biennial Natural Res. Study Rept. to Congress as required by P.L. 96-199. NMFS, SWR files, 67p.

Seagars, D.J., D.P. DeMaster, and R.L. DeLong. In prep. A survey of historic rookery sites for California and northern sea lions in the southern California Bight. NMFS, SWFC Admin. Rept. LJ-84.

Shaffer, M.L. 1981. Minimum population sizes for species conservation. Bioscience 31(2):131-134.

Shaughnessy, P.D., A. Semmelink, J. Cooper, and P.G.H. Frost. 1981. Attempts to develop acoustic methods of keeping cape fur seals Arctocephalus pusillus from fishing nets. Biol. Conserv. 21(2):141-158.

Stewart, B.S. 1982. Aerial censuses of pinnipeds on the Channel Islands of Southern California, 1981. In: Studies of the pinnipeds of the southern California Channel Islands, 1980-1981. H/SWRI Tech. Rept. 82-136. pp. 80-115.

Stewart, B.S. 1982. Beached and dead pinnipeds and cetaceans on San Nicolas and San Miguel Islands. In: Studies of the pinnipeds of the southern California Channel Islands, 1980-1981. H/SWRI 82-136. pp. 116-117.

Stewart, B.S. 1982. Behavioral response of northern elephant seals and California sea lions on San Nicolas Island, to loud impulse noise. In: Studies on the pinnipeds of the southern California Channel Islands, 1980-1981. H/SWRI Technical Rept. 82-136. pp. 4-35.

Stewart, B.S. 1982. Peak 1982 aerial census of harbor seal populations on the southern California Channel Islands. H/SWRI Tech. Rept. 82-143. Final Rept. to NMFS, SWFC, La Jolla, CA. 7p.

Stewart, B.S. 1982. Seasonal distribution, abundance and population dynamics of pinnipeds on San Miguel Island, 1980-1981. In: Studies of the pinnipeds of the southern California Channel Islands, 1980-1981. H/SWRI Tech. Rept. 82-136. pp. 71-79.

Stewart, B.S. 1982. Seasonal distribution, abundance and population dynamics of pinnipeds on San Nicolas Island, 1980-1981. In: Studies on the pinnipeds of the southern California Channel Islands 1980-1981. HSWRI. Tech. Rept. 82-136. pp. 36-70.

Stewart, B.S. 1982. The Guadalupe fur seal (Arctocephalus townsendi) on San Nicolas Island, California. Bull. So. Calif. Acad. Sci. 80(3):134-136.

Stewart, B.S. and S.D. Kovach. 1982. Northern elephant seals and California sea lions: new hosts for cattle egrets. Condor 84:243.

Stewart, B.S. and P.K. Yochem. 1983. Aerial surveys of pinniped populations in the Channel Islands National Park, 1983. HSWRI Tech. Rept. 82-165. Final Rept. to NMFS, SWFC, La Jolla. CA; contract 83-ABC-00136. 25 p.

Stewart, B.S. and P.K. Yochem. 1983. Radiotelemetry studies of hauling patterns movements and site-fidelity of harbor seals (Phoca vitulina richardsi) at San Nicolas and San Miguel Islands, California, 1982. HSWRI Tech. Rept. 83-152. Final Rept. to NMFS, SWFC, La Jolla, CA; contract NASO 82-00032. 18 p.

Sullivan, R.M. 1982. Agonistic behavior and dominance relationships in the harbor seal, Phoca vitulina. J. Mammal. 63(4):554-569.

Swartman, G.L. and R.T. Haar. 1983. Interactions between fur seal populations and fisheries in the Bering Sea. Fish. Bull. (US) 81(1):121-132.

Van Blaricom, G.R. and R.J. Jameson. 1982. Lumber spill in central California waters: implications for oil spills and sea otters. Science 215:1503-1505.

York, A.E. 1983. Age at first reproduction of the northern fur seal (Callorhinus ursinus). Can. J. Fish. Aquat. Sci. 40:121-127.

Waters, T. 1984. California sea lions: growing numbers and an expanding problem. So. Coast Sportfishing. March 1984:28-32.

Waters, T. 1984. What "Friends" say about the sea lions. So. Coast Sportfishing. March 1984:34-64.

Waring, G.H. 1983. Survey of Federally funded marine mammal research and studies FY 70 - FY 82. NTIS PB 83 - 262998. 91 p.

Wetherall, J.A. 1982. An analysis of double-tagging experiments. Fish. Bull. (US) 80(4):687-701.

Wolf, G.A. 1982. A beak key for eight eastern tropical Pacific cephalopod species with relationships between their beak dimensions and size. Fish. Bull. (US) 80(2):357-370.

ACKNOWLEDGEMENTS

The information contained in this report was synthesized and collected by a number of colleagues. I particualry thank G.A. Antonelis, Dr. R.L. DeLong, L. Firm, L. Hansen, S. Hawes, C. Heath, C. Oliver, B.S. Stewart, J. Wexler, and P. Yochem for collecting and providing unpublished information. G. Davis and W. Ehorn provided guidance from the National Park Service. Dr. D. P. DeMaster, J. Lecky, J.J. Slawson, and the Southwest Region editorial board provided draft review and comment.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1984-584-285/20018

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
National Marine Fisheries Service
Southwest Region
Terminal Island, CA 90731

POSTAGE AND FEES PAID
U.S. Department of Commerce
COM 210
THIRD CLASS MAIL

OFFICIAL BUSINESS